(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 217 038 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.09.2017 Bulletin 2017/37

(51) Int Cl.:
F16F 15/31 *(2006.01)*

(21) Application number: **17382097.8**

(22) Date of filing: **27.02.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **29.02.2016 ES 201630253**

(71) Applicant: **Munoz Saez, Cesar Juan**
08830 Sant Boi de Llobregat (ES)

(72) Inventor: **Munoz Saez, Cesar Juan**
08830 Sant Boi de Llobregat (ES)

(74) Representative: **Espiell Volart, Eduardo Maria**
R. Volart Pons y Cia. S.L.
Pau Claris, 77, 2.o, 1.a
08010 Barcelona (ES)

(54) **FLYWHEEL**

(57) FLYWHEEL. Comprises moving coupling means (7) that allow to vary the position of some weights (6) on one disk (4) and to modify the moment of inertia. The moving coupling means (7) are structured to modify the coupling gap of the said weights (6) to the central axis (5) of the disk (4); to vary the position of part of the weights (6) the disk (4) incorporates; and to vary the position of all the weights (6) the disk (4) incorporates. Moreover, comprise a series of slots (8) equidistant and radially performed on the disk (4) in which the weights (6) can move to be fixed in different areas thereof and the said weights (6) showing a configuration adapted for the said travel and fixation in the said different areas (81) of some slots (8) without they have to be withdrawn and said slots (8) are radially performed on the disk (4) around its central axis (5). The slots (8) are through slots, in order they can be crossed by the weights (6) and show a series of widenings (81) that mark weight (6) positioning areas. The weights (6) are constituted by two independent parts that are coupled by the respective back and front faces of the disk (4) through a connecting rod (63) duly threading and shows two different diameters (one wider than the other) and incorporates a spring (64). Each of the slots (8) incorporates, at least one weight (6).

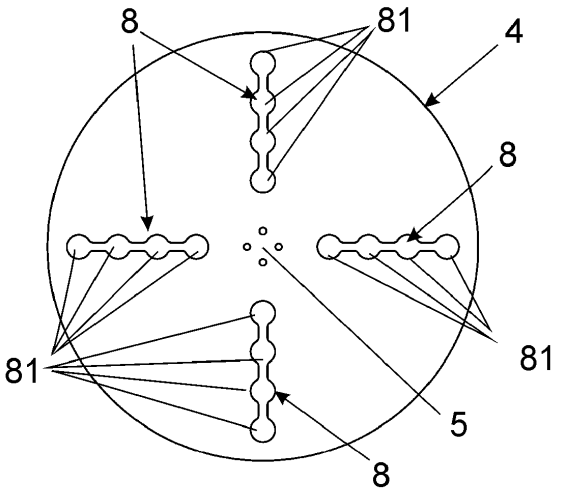

FIG. 2

EP 3 217 038 A1

Description

Object of the invention

[0001] The invention, as stated in the title of this specification, refers to a flywheel for example to be used in sport training or rehabilitation machines, that provides, to the function to which it is designed, advantages and characteristics that will be disclosed thereafter and that bring about a novelty in the state of the art.

[0002] The object of this invention refers to a flywheel applicable, for example, in gymnastic inertial, sport training or rehabilitation machines the structural configuration of which is especially designed to be able to quickly and simply modify the moment of inertia, without adding or removing mass to the wheel of the invention.

Field of application of the invention

[0003] The field of application of this invention is within the sector of the industry engaged in production of flywheels, especially those used in machines, equipment and devices for physical and sport training or rehabilitation, focused namely in those including inertial motion.

Background of the invention

[0004] As it is well known, the inertial motion machines are namely used for sport training since some years ago. Their operation is based on presenting a disk- or a wheel-shaped structure with a moment of inertia that, when rotating it around an axis, generates a rotational kinetic energy.

[0005] The problem of these machines is that, until now, the way of changing their moment of inertia was based on adding or removing weights to the inertial disk or flywheel or, directly, on changing the flywheel itself to be replaced by another having a different weight and/or radius.

[0006] The said action causes that the suitable adjustment of the moment of inertia for each user or exercise is a slow and cumbersome process.

[0007] In addition, the said exchanging disks or adding and removing weights, makes that there are loose elements that can be lost or be little practical for the commercial use.

[0008] The objective of this invention therefore is, to develop a new type of flywheel that allows to overcome these problems described allowing to vary the moment of inertia as suitable for each user or in each exercise, without removing or putting weights, and therefore in a much quicker, practical and simple way.

[0009] On the other hand, and as reference to the state of the art, it can be pointed out that, at least this applicant is not aware of the existence of any other flywheel for this type of machines or any other invention of similar application, showing technical, structural and constitutive techniques similar to those presented and claimed.

Description of the invention

[0010] The flywheel especially adapted to be used in the sport training or rehabilitation machines proposed by the invention is therefore configured as a novelty within its field of application, because when implementing it the mentioned objectives are satisfactorily reached, the features making it possible are included in the final claims attached to this specification.

[0011] Concretely, what the invention proposes, as it was mentioned before, is a flywheel, namely applicable in gymnastic, sport training or rehabilitation inertial machines, the structural configuration of which is distinguished for allowing to modify the moment of inertia, without adding or removing weights and it is achieved by varying the distribution of the mass within the wheel.

[0012] The moment of inertia of a solid, cylindrical flywheel is calculated by means of the following mathematical formula:

$$I = \frac{1}{2} M R^2$$

I: Inertia
M: Mass of the wheel
R: Radius of the wheel

[0013] The calculation of the inertia of flywheels having other shapes must be carried out by means of another mathematical formula but a direct relation between the mass and turning radius always exists.

[0014] For this purpose, the said wheel is configured so that it incorporates moving coupling means for the weights that allow to change the said distribution of the mass and achieve this modification of the moment of inertia, namely means that allow to vary the radius, that means, the gap to the centre of the disk, of a part or the full mass, without adding or removing elements.

[0015] In the preferred embodiment of the invention, the wheel includes a disk showing on its surface a series of slots in which the weights are located, being coupled so that they can be moved in different areas of the said slots in order that they can be fixed more or less close to the spin axis and, so, they allow to vary the moment of inertia without changing the disk or adding or removing any of the elements of the assembly.

[0016] In another preferred embodiment, the weights include an internal thread and they can be radially moved along threaded pins.

[0017] The main advantages provided by the wheel of the invention are that, from the commercial standpoint they mean the great advantage that a machine can be quickly exchanged by several users and easily and suitably configured for each user and/or movement.

[0018] It is also a great advantage for the large sport facilities or centres where many users use the machines, especially in order that there are no free or loose ele-

ments that could cause incidents, loss of their functionality or misuse.

[0019] Likewise, another significant advantage is that quickly and simply, a same user can adapt the moment of inertia he is willing depending on the exercise he is carrying out.

[0020] The flywheel of the invention consists, therefore, in an innovating structure having characteristics unknown until now for the purpose to which it is designed, reasons that jointly to its practical utility, provide it with sufficient ground to obtain the privilege of exclusivity applied for.

Description of the drawings

[0021] To complement the description that is carried out and in order to assist to a best understanding of the characteristics of the invention, attached to this specification, as an integral part thereof, is a set of drawings in which, for illustration and no limitation purpose, the following has been represented:

Figure number 1.- It shows an elevation view of the flywheel together with the parts composing the weights.

Figure number 2.- It shows an elevation view of the flywheel (without the parts composing the weights), showing the radial slots it incorporates to place the weights; and

Figure number 3.- It shows an elevation view of the parts composing the weights duly mounted.

Figure number 4.- It shows an elevation view of the parts composing the weights dismounted.

Figure number 5.- It shows a perspective view of the parts composing the weights dismounted.

Preferred embodiment of the invention

[0022] From the said figures, and according to the numbering chosen, a no limiting example of embodiment of the flywheel of the invention can be seen, which includes the parts and elements stated and described below.

[0023] Thus, as it is apparent in the said figures, the wheel (1) in question is designed to be incorporated for example to a sport training or rehabilitation machine, linked to a hauling cable through a system of pulley, including , in a well known way, at least a disk-shaped part (4) rotating about a central axis (5) and incorporates a series of weights (6) that, depending on their distribution and their own weight provide a given moment of inertia. Starting from this already known configuration the wheel (1) is distinguished in that it has moving coupling means (7) that allow to vary the position of the said weights (6) on the disk (4) of the wheel and to modify the moment of inertia, without it is necessary to withdraw or replace any of the weights (6) or the disk (4).

[0024] Preferably, the moving coupling means (7) allow to independently vary the gap between the weights (6) with respect to the central axis (5) of the disk (4). In general, the weights have to be symmetrically located with respect to the central axis (5) in order the inertial movement is regular.

[0025] In a preferred embodiment of the invention, the moving coupling means (7) of the weights (6) to the disk (4) include a series of slots (8) performed in the disk (4) in which the weights (6) can be moved to be fixed on different areas of them and because of the fact that the weights (6) show a configuration that allows that an easy travel and their fixation in different areas of the slots (8) without they have to be withdrawn.

[0026] As apparent in the figure 2, the slots (8) that are radially arranged on the disk (4) around its central axis (5), are through slots, in order they can be crossed by the weights (6), and such slots showing a series of widenings (81) marking, in coinciding points in all of them, the different areas of weights positioning (6), allowing to carry out the travel of one or more weights (6) in each slot (8) of the disk (4) in a balanced way, to bring it more or less close to the said central axis (5) and this way modify the moment of inertia.

[0027] Meanwhile, the weights (6), as shown in the figures 3 to 5, in the preferred embodiment are constituted by two independent parts, a back one (61) and a front one (62) that are coupled by the respective back and front sides of the disk (4), inserted in the slots (8), through a connecting rod (63) that allows such coupling, for example working through threading , resulting adapted to allow the travel of the weights (6) through the slots (8) to place them on the widening (81) sought without their withdrawal from them is necessary .

[0028] Also the connecting rod (63) shows two different diameters (one wider than the other) and it incorporates a spring (64) so that when the weight (8) is pressed towards the disk this later can travel through the slots (8) from a widened area (81) to another and when the pressure on it is released it remains locked in the widened area where it is located when the diameter of the rod is coincident with the diameter of the widened area.

[0029] Advantageously, although without it means a limitation, the disk (4) has available several slots (8) spread equidistant and radial around the central axis (5) and, also in a preferred but not limiting way, each of the said slots (8) incorporates, at least a weight (6).

[0030] As it can be deducted, to modify the moment of inertia of this wheel (1) in the said machine, it will be sufficient to move the weights (6) and have them travelling through the related slots (8) of the disk (4) to bring them more or less close to the central axis (5) and, therefore without it is necessary to withdraw or change the disk.

[0031] In another preferred embodiment, the moving

coupling means (7) of the weights (6) to the disk (4) include a series of Z-shaped slots (8), and the weights remain fixed by a magnet. In this preferred embodiment there would be no widenings, and the disk would remain locked by each angle of the Z when it is subject to a centrifugal energy.

[0032] In another embodiment, the moving coupling means (7) of the weights (6) to the disk (4) include a series of threaded pins (8) radially located on the disk (4) in which the weights (6) incorporating an internal thread can move to be fixed in different areas thereof.

[0033] The nature of this invention being sufficiently disclosed, as well as the way of implementing it, it is not deemed necessary to provide a wider explanation in order that any expert on the matter understands its scope and the advantages arising from it, stating that, within its essence, it can be implemented with other embodiments different in details of the one disclosed for example purpose and which the protection sought also includes provided that the main principle is not altered, changed or modified.

Claims

1. Flywheel including at least a disk-shaped part (4) rotating about a central axis (5) and a series of weights (6) which distribution with respect to the central axis (5) and weight provides a given moment of inertia, is **characterized in that** it in addition includes moving coupling means (7) that allow to vary the position of the said weights (6) on the disk (4) and to modify the moment of inertia.

2. Flywheel according to the claim 1, **characterized in that** the moving coupling means (7) are structured to modify the coupling gap of the said weights (6) to the central axis (5) of the disk (4).

3. Flywheel according to the claim 1 or 2, **characterized in that** the moving coupling means (7) are structured to vary the position of part of the weights (6) the disk (4) incorporates.

4. Flywheel according to the claim 1 or 2, **characterized in that** the moving coupling means (7) are structured to vary the position of all the weights (6) the disk (4) incorporates.

5. Flywheel according to the claim 1 to 4, **characterized in that** the moving coupling means (7) include a series of slots (8) performed on the disk (4) in which the weights (6) can move to be fixed in different areas thereof and the said weights (6) showing a configuration adapted for the said travel and fixation in the said different areas (81) of the slots (8) without they have to be withdrawn.

6. Flywheel according to the claim 5, **characterized in that** the slots (8) are radially performed on the disk (4) around its central axis (5).

7. Flywheel according to the claims 5 to 6, **characterized in that** the slots (8) are through slots, in order they can be crossed by the weights (6).

8. Flywheel according to the claims 5 to 7, **characterized in that** the slots (8) show a series of widenings (81) that mark, in points coinciding in all of them, the different weight (6) positioning areas.

9. Flywheel according to the claim 7, **characterized in that** the weights (6) are constituted by two independent parts, a back part (61) and a front part (62) that are coupled by the respective back and front faces of the disk (4), inserted in the slots (8), through a connecting rod (63).

10. Flywheel according to the claim 9, **characterized in that** the connecting rod (63) operates by threading for coupling between the two parts (61-62) forming the weights (6).

11. Flywheel according to the claim 9, **characterized in that** the connecting rod (63) shows two different diameters (one wider than the other) and incorporates a spring (64) so that when the weight (8) is pressed towards the disk this later can travel through the slots (8) from a widened area (81) to another and when it is no longer pressed, it remains locked in the widened area where it is located as the diameter of the rod is coincident with the diameter of the widened area.

12. Flywheel according to any of the claims 5 to 11, **characterized in that** the disk (4) has available several slots (8) equidistantly and radially spread around the central axis (5).

13. Flywheel according to the claims 5 to 12, **characterized in that** each of the slots (8) incorporates, at least one weight (6).

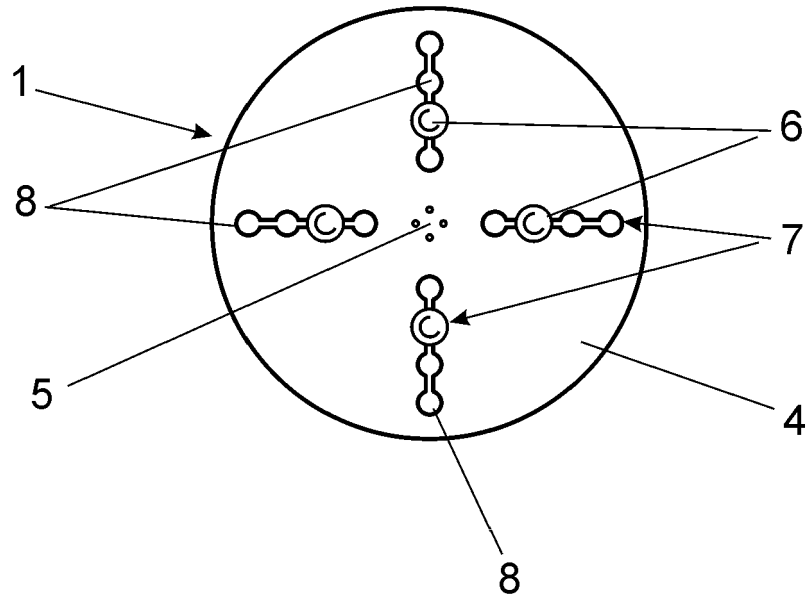

FIG. 1

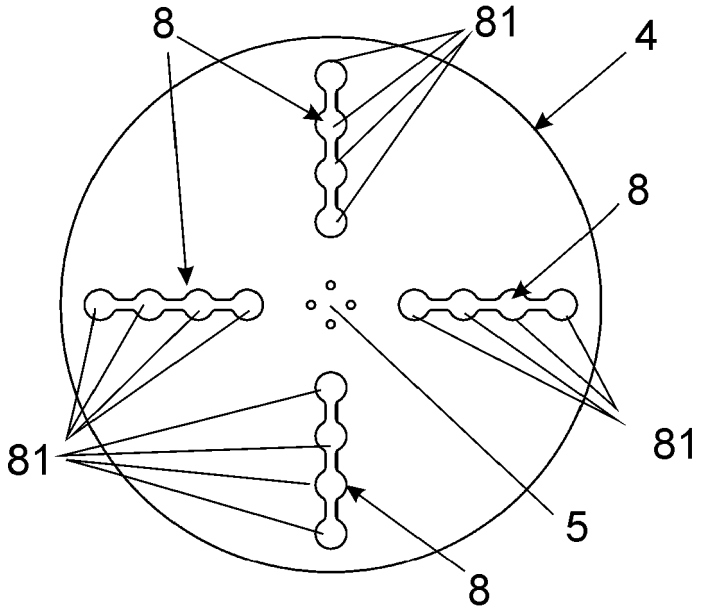

FIG. 2

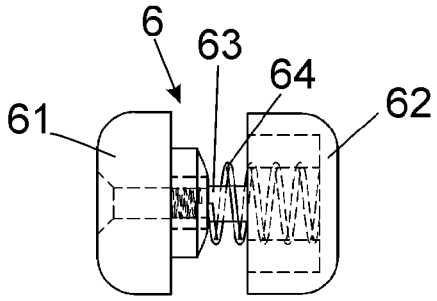

FIG. 3

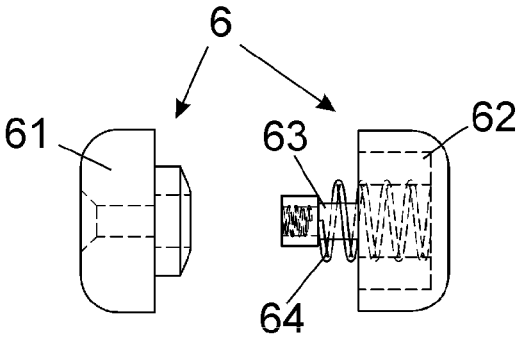

FIG. 4

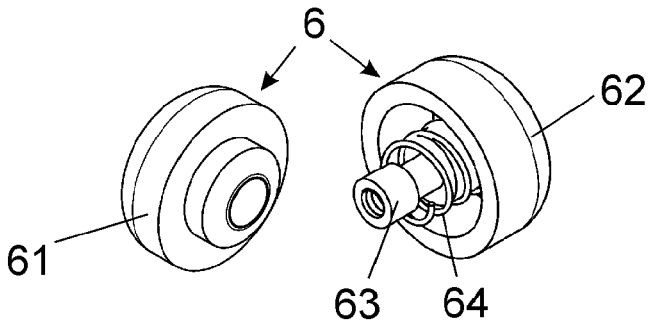

FIG. 5

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 17 38 2097

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	JP 2014 160037 A (SEIKO INSTR INC) 4 September 2014 (2014-09-04) * figures 13,14 * -----	1-7,9, 10,12,13 8,11	INV. F16F15/31
X	CH 705 238 A2 (NIVAROX SA [CH]) 15 January 2013 (2013-01-15) * figure 3 * -----	1,8	

TECHNICAL FIELDS SEARCHED (IPC)

F16F
G04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 August 2017	Beaumont, Arnaud

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 17 38 2097

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

03-08-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2014160037 A	04-09-2014	JP 6070937 B2	01-02-2017
		JP 2014160037 A	04-09-2014
CH 705238 A2	15-01-2013	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82